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ABSTRACT

This paper is based on the first use of program administrative data from Brazil's unemployment insurance (UI) program to assess the impact of changes in UI eligibility criteria on layoff probabilities. We exploit exogenous program changes introduced by executive and legislative changes in 2015 to estimate impacts while accounting for the number of prior UI benefit requests. We estimate that changes in UI eligibility criteria had heterogeneous impacts distinguished by the number of prior benefit requests. We show that the 2015 changes in UI eligibility rules reduced layoffs and find evidence that the changes reduced collusion between workers and employers for layoffs because it became harder to extract subsidies from the UI system. The layoff reductions were greatest before workers' second benefit request.

INTRODUCTION

Unemployment insurance (UI) partially replaces income lost during involuntary unemployment, prevents descent into poverty, and plays a crucial role in protecting people as it serves as an automatic counter-cyclical macroeconomic stabilizer (ILO 2011). It has been estimated that the UI program in the United States mitigated the loss in real GDP by an average of 15 percent in the five recessions from the late 1960s to the early 1990s (Chimerine et al. 1999). The UI income multiplier was estimated to be 2.0 in the Great Recession (Vroman 2010).

Prior research has also examined the incentive effects of UI, which may impact labor market outcomes. The evidence comes mostly from developed countries, where unemployment benefit programs have existed since early in the twentieth century.[1] Some countries have extended the duration of UI benefits, while others have shortened potential durations. Academic research has focused on the effects of changes in the UI wage replacement rate, the potential duration of benefit payments, the unemployment exit rate, the time to reemployment, and reemployment earnings (e.g. Decker 1997; Woodbury 2014).[2] Evidence on UI and incentives is paramount for proper design of UI systems, including strategies to adjust benefit levels and potential durations, particularly during economic crises (e.g. Tatsiramos 2014).

The research literature is focused less on the probability of being laid off and more on the effects of UI benefit payment costs on employers in the United States, where employer UI tax rates are experience rated—meaning that firms' UI tax costs rise with increased worker layoffs.[3] However, with imperfect experience rating, changes in the rules for UI benefit eligibility might affect unemployment differently than expected. Additionally, papers on models of implicit

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[1] The longest standing UI programs started around the beginning of the twentieth century in Germany and Great Britain and became common in industrialized countries, including Canada, France, and the United States during the Great Depression (Mazza 2000).

[2] Researchers use legislative reforms and changes in the potential duration of UI benefits to model program changes. Initial research on the reform of job search requirements dates back to Corson, Nicholson, and Long (1985) on the link between UI and the public employment service. Johnson and Klepinger (1994) examined the effect of eliminating the UI work search requirement in a randomized controlled trial in Tacoma, Washington, and Lachowska et al. (2015) extended the Tacoma study by adding newer administrative data on earnings. Along the same lines, McVicar (2010) studied the effect of a temporary withdrawal of job search monitoring during a series of benefit office refurbishments in Northern Ireland. Van Ours and Vodopivec (2006, 2008) studied how shorter potential UI duration affected wages and the probability of securing a permanent job after the Slovenian UI reform of 1998.

[3] In a perfect experience-rated system, changes in the level of benefits do not distort incentives to lay off workers. On the other hand, in an imperfect system, changes in the benefit rules might distort incentives when firms do not incur extra cost to dismiss workers.

contracts suggest that workers and firms collude to extract subsidies from the UI system (Feldstein 1976). Analyzing whether social insurance programs affect the rate at which firms hire and lay off workers using modern quasi-experimental designs is a very promising area for further research (Chetty and Finkelstein 2013). This paper uses unique administrative data for Brazil and contributes to this literature by providing evidence in the absence of experience rating of firm's tax contributions.

In most developing countries, UI programs operate on a small scale. Brazil is one of the few developing countries to have a comprehensive UI program (ILO 2011). Its UI program was conceived as a tool to stabilize unemployment during the economic crisis of the 1980s. It was designed as a temporary program and a short-term instrument (Mazza 2000). Brazil's UI program is now the largest in the Latin American Caribbean region. It received more than 41 million benefit requests and made US$53 billion in payments between 2012 and 2016.[4] Still, the UI recipiency rate (workers who receive UI as percentage of the unemployed), which at 13 percent is the highest in the Latin American Caribbean region, is low compared to the recipiency rates of 26 percent in the United States and 40 percent in Canada (Alaimo et al. 2015).[5]

UI in Brazil might successfully smooth the consumption for some workers who lose their jobs, but it has unknown effects on labor market outcomes. Studies in Argentina, Colombia, Uruguay, and Brazil find that UI smooths consumption but does not improve reemployment wage rates. Likewise, the parameters of Brazilian UI (eligibility requirements, potential duration, and benefit amounts) may have negative effects on unemployment duration and on the probability of returning to a formal job (Alaimo et al. 2015).

Despite its size and history of changes in benefit design, evidence on the incentive effects of UI in Brazil is limited. Prior studies have focused on the effect of UI on the formal sector attachment rate (Cunningham 2000), and unemployment duration and reemployment rate (Gerard and Gonzaga 2013, 2018).[6] Surprisingly, studies focusing on the probability of being laid off have

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[4] According to the UI administrative data provided for this study and Silva (2019).

[5] UI is available for formal workers only in Brazil; the informal rate was 44 percent in the first quarter of 2015 according to IPEA Labor Markets Bulletin.

[6] Formal sector attachment rate, duration, and reemployment rate are commonly used labor outcomes in evaluations of more developed countries. Cunningham (2000) suggests that the probability of formal sector attachment did not change as a result of increased UI benefit value in 1994. Gerard and Gonzaga (2013, 2018) estimated the effect on coverage duration of a temporary extension of Brazilian UI benefits in 1996 that provided two additional months of UI payments to unemployed workers who had exhausted their benefits in the largest metropolitan areas.

received little attention in Brazil, although some studies emerged after UI program reforms were enacted in 2015.

A recent study by Ferdinandus et al. (2017) examined the effect of stricter UI eligibility criteria in Brazil and found a decrease in unemployment, an increase in formal sector wages, but a reduction in movement from informal labor jobs to formal sector employment. Similarly, Carvalho, Corbi, and Narita (2018) explored the effect on layoffs of the 2015 changes in eligibility criteria for UI benefits in Brazil, and they found that the probability of layoffs decreases for the workers that lose eligibility for UI. Both studies suggest that workers and employers have an incentive to strategically manage their dismissals to collect UI benefits.

Our study builds on the work by Carvalho, Corbi, and Narita (2018) and Ferdinandus et al. (2017) but differs from their work in many ways. First, our study is based on detailed administrative data from Brazil's UI program that were not available for the previous studies. Second, previous studies were not able to count the number of times each worker requested UI benefits and therefore were not able to identify whether workers are accessing UI for the first, second, or subsequent time. Consequently, they generate imprecise results because, under the two 2015 program changes, the eligibility rules are different the second and third times a person applies for UI benefits than they are in the first application for benefits. Thus, we do a more in-depth analysis on the heterogeneous effects of the UI reforms by accounting for the number of prior requests (applications for UI). Third, our data provide the exact job starting and ending dates, allowing for more precise construction of treatment and control groups. Fourth, in our data we directly observe whether a worker receives UI benefits. Previous researchers could only infer if workers were beneficiaries based on the length of job tenure available in matched data from other sources.

The estimates in this paper, based on unique and more complete data on UI, suggest that changes in the UI eligibility criteria had heterogeneous impacts on workers according to the number of prior benefit requests. Because of data limitations, results reported in recently published studies overestimate the reduction in dismissal probabilities resulting from the 2015 changes in benefit eligibility rules. Our study, based on more complete data, provides better guidance for public policy. We are able to provide more precise estimates showing that the changes in program eligibility rules were more effective in reducing strategic job separations before a second benefit

request. Detailed administrative data are essential to such program evaluation to properly inform policymakers about the impact of program changes in the UI system.

The rest of the paper is organized as follows. We first explain the changes in the Brazilian UI program that we examine and then describe the unique data used for the paper and provide descriptive statistics on our analysis variables as well as present the empirical strategy. We then present the results, followed by a brief conclusion.

RECENT CHANGES IN THE BRAZILIAN UI PROGRAM

The Brazilian UI program recently underwent two significant changes in eligibility rules. The old scheme required earnings of at least the minimum monthly wage in six consecutive months prior to involuntary job loss.[7] Eligible applicants qualified for between three and five months of benefits based on the duration of previous employment. Under the old rules (Law 7.998), all subsequent claims for UI benefits would require new work experience of at least six consecutive months within the 36 months before application (Table 1).

On December 30, 2014, Provisional Measure 665 was signed by the president. A provisional measure (PM) is a unilateral presidential executive order that has the force of law, and this PM tightened eligibility criteria for UI benefits. PM 665 became effective 60 days after its enactment (at the end of February 2015). While it was anticipated that UI would be reformed at some point, both the sudden implementation and the content of the new measure were completely unexpected.[8] The rationale offered for tightening eligibility criteria was the potential reduction in fraud and improper UI benefit payments (Carvalho, Corbi, and Narita 2018). Furthermore, since the PM was not subject to legislative refinements, the program changes introduced were not debated before they became effective. According to the Inter-Union Department of Statistics and Socioeconomic Studies (DIEESE in Portuguese), the original justification for changing UI eligibility rules was related to concerns about improving the public budget.[9] These 2015 federal fiscal adjustments in Brazil were aimed at reducing opportunities for collusion between workers

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[7] The 2017 minimum monthly wage was R$937 in Brazilian formal sector employment or about US$295 in December 2017. The minimum monthly wage rose from R$620 in 2012, about 50 percent in nominal terms.
[8] Reports in the media at the time are evidence that the content of the new legislation was unexpected.
[9] DIEESE (2015), in the notes "Considerações sobre as medidas provisórias 664 e 665."

and employers to extract earnings subsidies from the UI system. If formal workers are dismissed, they are entitled to UI benefits, plus the right to withdraw the accumulated balance in their severance fund (FGTS) and receive an amount equal to 40% of the balance accumulated in the FGTS as a fine paid by their employer.[10]

Table 1 Months of Employment for UI Initial Eligibility and Potential Benefit Durations in Brazil, 1990-2017

Ordinal number of benefit spell	Potential benefit duration	Law 7.998 from 1990 to 2/27/2015		PM 665 from 2015 (28/2/2015 - 6/16/2015)		Law 13.134 from 6/17/2015	
		Initial eligibility	Potential duration	Initial eligibility	Potential duration	Initial eligibility	Potential duration
First	Three		6/36				
	Four	6/6	12/36	18/24	18/36	12/18	12/36
	Five		24/36		24/36		24/36
Second	Three		6/36				9/36
	Four	6/6	12/36	12/16	12/36	9/12	12/36
	Five		24/36		24/36		24/36
Third or more	Three		6/36		6/36		6/36
	Four	6/6	12/36	6/6	12/36	6/6	12/36
	Five		24/36		24/36		24/36

NOTES: Potential durations are months worked/length of reference period (in months). The reference period is the period of time used for the calculation of the eligibility criteria, in this case 36 months. During the reference period, the number of months worked will be counted to define eligibility before the application for UI benefits. For initial eligibility, one credit month requires at least one day with earnings at a formal sector job in a month. To determine potential duration of benefits, one month requires at least 15 days with earnings at a formal sector job in a calendar month.

When PM 665 became effective on the last day of February 2015, the requirements to obtain UI in the first and second requests became stricter. First-time applicants were required to have had at least 18 months of employment at or above the minimum monthly wage in the 24 months prior to dismissal. The second request for UI required earnings of at least the minimum monthly wage in 12 of the last 16 months before UI benefit application. The third and subsequent UI requests required six continuous months of employment before application (see Table 1).

The general discontent with the implementation of the PM generated a legislative debate in April 2015, and PM 665 was revised before it was finally submitted for legislative approval and

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[10] Additionally, there is no marginal tax per worker dismissed. UI benefits are financed mainly from payroll taxes that are compulsory and include 20% for Social Security and 8% paid to the severance fund (FGTS). Brazilian law has two classifications for dismissals. Unjustified dismissal occurs when workers are dismissed without any serious misconduct according to the law. In this case, workers are eligible for UI and gain access to severance fund resources. Justified dismissal occurs when workers engage in misconduct, and in this case, workers are not eligible for UI and do not gain access to severance fund resources.

resulted in a new law. Law 13.134 of June 2015 revoked the UI eligibility timelines established in PM 665 and established criteria that, while stricter than the old ones (under Law 7.998), were somewhat less demanding than those under the PM. Under the new rules, first-time UI claimants must earn at least the minimum monthly wage during at least 12 of the last 18 months prior to dismissal to obtain the benefit. For the second request, employment with at least minimum monthly wages is required during 9 of the last 18 months prior to the dismissal, and the rest of the eligibility criteria remained unchanged (Table 1). Importantly, the UI legislation determines that to record one month for the eligibility criteria and determination of duration, at least 15 days with earnings are required at a formal sector job in a calendar month.[11]

The administrative data used for this paper allow for proper measurement of all eligibility situations presented in Table 1. These data provide the opportunity for a precise study of applications for UI benefits in all possible contexts.

DESCRIPTIVE STATISTICS AND DATA FOR ANALYSIS

Data on UI applicants was provided by the Brazilian Ministry of Labor from program administrative records for the period 2012–2016. Based on these data, Table 2 reports the number of UI requests by year. The stricter requirements for UI eligibility in PM665 and Law 13.134 may be the reasons for the year-to-year declines in UI requests of 6.9 percent and 7.7 percent in 2015 and 2016, respectively. It is noteworthy that these declines in requests occurred in a period of

Table 2 UI Requests by Year, 2012–2016

	Old regulation	Provisional measure	New regulation	Total	Percentage change
2012	8,061,890	0	0	8,061,890	–
2013	8,570,519	0	0	8,570,519	6.3%
2014	8,799,921	0	0	8,799,921	2.7%
2015	1,396,589	2,489,420	4,305,365	8,191,374	-6.9%
2016	0	0	7,562,920	7,562,920	-7.7%
Total	26,828,919	2,489,420	11,868,285	41,186,624	–

SOURCE: Authors' calculations, based on data from the Brazilian Ministry of Labor.

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[11] According to the UI legislation, a person who works at least 15 days in January (counts as one month), then works in the four subsequent months and at least 15 days in June accumulates six months toward UI eligibility. The data used in this paper and described in the next section provide a means to better account for these criteria than data used in previous studies of the 2015 UI reforms in Brazil.

generally increasing unemployment. Analysis in this paper informs the question of whether these reductions in UI applications are associated with changes in UI eligibility rules.

Table 3 presents the number of UI payments under each eligibility regime by the number of payments in the years 2012 to 2016. The table shows that most requests are concentrated in the first and second requests, and that relative to the first and second, the numbers of third requests drops precipitously after PM 665 and Law 13.134.[12]

Table 3 Brazil UI Payments by Eligibility, 2012–2016

		Payments eligible	Payments made					Total
			1	2	3	4	5	
Old regulation	First request	3	33,626	148,665	1,984,423			2,166,714
		4	45,406	87,778	314,890	2,624,556		3,072,630
		5	81,903	119,600	200,060	601,919	3,352,936	4,356,418
	Second request	3	12,959	46,783	538,468			598,210
		4	35,845	65,148	203,526	1,559,948		1,864,467
		5	84,941	138,344	215,527	575,247	3,001,638	4,015,697
	Third + request	3	7,549	25,486	271,657			304,692
		4	24,505	44,674	126,987	910,817		1,106,983
		5	66,552	109,527	160,673	394,228	1,958,478	2,689,458
Provisional measure	First request	3	-	-	-			0
		4	1,037	1,831	2,773	109,431		115,072
		5	5,170	8,438	10,415	16,196	426,903	467,122
	Second request	3	-	-	-			0
		4	2,481	4,098	5,570	168,678		180,827
		5	5,228	8,789	10,585	14,762	336,670	376,034
	Third + request	3	1,534	1,946	38,720			42,200
		4	2,152	3,561	4,635	118,299		128,647
		5	4,257	6,841	7,971	10,434	220,558	250,061
New regulation	First request	3	-	-	-	-	-	0
		4	11,885	20,125	30,327	1,220,459		1,282,796
		5	29,284	50,160	61,434	85,177	2,546,584	2,772,639
	Second request	3	6,889	8,061	148,218			163,168
		4	10,978	19,252	26,281	775,516		832,027
		5	20,284	34,390	41,286	54,053	1,378,512	1,528,525
	Third + request	3	8,277	9,995	169,503			187,775
		4	8,995	15,875	21,131	532,848		578,849
		5	14,518	24,545	29,391	36,728	883,942	989,124

SOURCE: Authors' calculations, based on data from the Brazilian Ministry of Labor

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[12] All formal workers in Brazil have an Employment Book that registers all formal jobs. Firms are obliged by law to update these records in the national database administered by the Ministry of Labor. For standard cases, when workers are dismissed, the administrative system is thus able to verify a worker's eligibility. Applications are allowed in the system only if workers qualify. Therefore, there are few differences between applications and benefit receipt.

Data on UI used in this study are much more accurate and detailed than those used by previous researchers studying the 2015 UI reforms in Brazil. In particular, our data provide the number of prior UI benefit episodes for every worker. This is essential to properly measure the effects of changes in eligibility rules; this is a sharp contrast with Carvalho, Corbi, and Narita (2018) who did not know the number of prior UI requests and simply inferred UI eligibility based on work history data in the Relacao Anual de Informacoes Sociais (RAIS) (annual social information report).[13] RAIS data are compiled by the Brazilian Ministry of Labor and contain employment information on all formally employed workers in a given year. All formally registered firms in Brazil annually report information on their employees to the Ministry of Labor. RAIS includes detailed information on the employer, the employee, and the employment relationship (wage, tenure, type of employment, hiring and dismissal date, reason for dismissal, among others).

Our analysis relies on data from both UI administrative records and RAIS. An essential feature of RAIS for our project is its history of job starting and ending dates for each worker in the formal sector. The UI administrative data tell us whether a worker is a UI recipient and the number of prior UI benefit requests for all formal sector workers. Therefore, in any month, we know who is working and who is not, and for each of these, we know how many months they have been working at their current or separating employer. We can precisely assess monthly employment, which is necessary because the UI legislation requires qualifying work to include at least 15 days with at least minimum wage earnings at a formal sector job in a calendar month.[14] Because there are some workers who have applied for UI more than once in a given month, we only count one request per month that actually resulted in payment of benefits.[15]

Our data for analysis are limited to formal private sector workers with open-ended contracts who are more than 18 years of age. We focus on the job with the longest tenure if RAIS records more than one job for one worker with the same firm. Additionally, our treatment and control

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[13] Van Doornik et al.'s (2018) data indicate whether a worker was affected by the reform (workers requesting benefit for the first or second time), but they were not able to identify which workers are in their first or second request.

[14] We replicate the data construction and results provided by Carvalho, Corbi, and Narita (2018), which are less precise and based on a sample of 10 percent of the data, to illustrate the benefits of using the better and more complete data used in this paper. Results for the replication exercise are available upon request.

[15] There is a small percentage of cases (ranging from 0.1 to 0.9 percent) where number of payments is different from standard cases, mainly because of judicial decisions or residual payments from previous eligibility that were stopped due to temporary employment. We eliminated applicants who did not get UI benefits or were in the interval that allows for residual installments, that is, when the number of payments was different from three, four, or five.

groups for analysis are restricted to workers who met the prior job tenure UI eligibility condition with a single recent job, or for control groups, barely failed to meet the condition.[16]

Our UI and RAIS data allow us to precisely assess the UI eligibility status of each individual applicant according to the requirements of the PM and legislation. The data provide the lifetime count of UI benefit requests, and we know the job tenure of each worker or laid off worker each month.

EMPIRICAL STRATEGY

Our analysis exploits exogenous policy changes affecting eligibility conditions for the first and second UI requests. In particular PM 665 was not expected before enactment in February 2015. Similarly, new UI regulations in Law 13.134 became effective in July 2015 without previous notice. These unexpected announcements are the identification basis for our definition of exogenous program "treatment" variables for estimation of causal treatment effects. The 2015 PM and law affected workers' UI eligibility according to their job tenure, as shown in Table 1. The treatment design is summarized in Table 4.

Table 4 Treatment Design for Contrasts on the First and Second UI Requests

Request	Data subset	Job tenure (in months)	Before 02/2015	PM (03/2015 to 06/2015)	New regulation (after 06/2015)
First	Control (1)	5	Ineligible	Ineligible	Ineligible
	Treatment (1)	6	Eligible	Ineligible	Ineligible
	Control (2)	18	Eligible	Eligible	Eligible
	Treatment (2)	17	Eligible	Ineligible	Eligible
Second	Control (3)	5	Ineligible	Ineligible	Ineligible
	Treatment (3)	6	Eligible	Ineligible	Ineligible
	Control (4)	9	Eligible	Ineligible	Eligible
	Treatment (4)	8	Eligible	Ineligible	Ineligible

NOTES: The calculation of job tenure in months follows the criteria used for the accumulation of months according to the UI legislation (see the section on descriptive statistics and data). Subset (1) includes workers who are first-time UI applicants with at least 5 but less than 6 months of tenure in the control group and at least 6 but less than 7 months in the treated group. Subset (2) includes first-time UI applicants with 17–18 months of tenure in the treated group and 18–19 months in the control group. Subset (3) includes second-time UI applicants with 5–6 months of tenure in the control group and 6–7 months in the treated group. Subset (4) includes second-time UI applicants with 8–9 months of tenure in the treatment group and 9–10 months in the control group.

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[16] Workers that separate from a job with justified dismissal are not eligible for UI.

To analyze the effects of eligibility rule changes for UI applicants making their first request, data subset 1 includes workers with five months (control) and six months (treated) of prior job tenure. The eligibility criteria modified by PM 665 implies a change in status from eligible to ineligible for individuals with six months of job tenure. Thus, the treated group are those who would have been eligible for UI until February 2015 and would be ineligible with the introduction of PM 665 and remained ineligible from then on. The control group, individuals with tenure of five months, would be ineligible throughout the period. Data subset 2 includes workers with tenures of 17 months (treated) and 18 months (control). Similar to subset 1, the control group remains eligible over the whole time period. Workers in the treated group were eligible for UI until February 2015 and after June 2015, but they were not eligible in the period between these months.

For the second request, data subset 3 includes observations with the same prior job tenures as data subset 1 for the first request, but the treatment observations include only UI applicants with one previous UI application. Data subset 4 comprises workers with tenure of eight months (treatment) and nine months (control). While the control group is UI eligible both before February 2015 and after June 2015, the treated group was eligible for UI until the end of February 2015, but it became and remained ineligible afterwards.

Regression Specification

We estimate the impacts of both provisional and newly legislated UI eligibility changes relative to the prior law on the probability of dismissal using the following full-interaction difference-in-difference equation:[17]

$$Y_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 PM + \beta_3 NewLaw + \beta_4 T_{it} * PM + \beta_5 T_{it} * NewLaw + \beta_6 X_{it} + \mu_t + \beta_7 T_i * Month_t + \beta_8 T_i * t + \varepsilon_{it}$$

where Y_{it} is a dummy variable that takes the value 1 if worker i is laid off from work in month t and the value 0 if not, *PM* takes the value 1 for the months when the PM was in force (03/2015 to 06/2015) and 0 otherwise, and *NewLaw* takes the value of 1 for the months July to December 2015 and zero otherwise. T_i represents the four treatment dummy variables for the first and second UI requests for the short and long prior tenure data subsets—each variable vector includes 1 for a

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[17] The treatment impacts of PM 665 and Law 13.134 could also be estimated in separate difference-in-difference models, which would provide identical results. However, we chose to estimate the effects in one equation as in Rocha, Ulyssea, and Rachter (2018).

treatment observation and 0 otherwise. Vector X_{it} includes worker's characteristics such as the industrial sector and size of their prior employer (given by the number of workers), prior occupation, state where last job is located, sex, race, age, and educational attainment; and μ_t is a matrix with 24 year-month time fixed-effects dummy variable vectors since the model is estimated on monthly data for 2014 and 2015. In the regressions, $T_i * t$ stands for the time linear trend variable and $T_i * Month_t$ accounts for group specific seasonality. The model is estimated on data subsets 1, 2, 3, and 4. Two separate models are estimated for the first request and (data subsets 1 and 2) and two separate models are estimated for the second request (data subsets 3 and 4).[18] Treatment and control groups for these models are defined as follows given the eligibility criteria presented earlier[19]:

Treatment (T_{it}) for the first request is defined as:

$$
Treatment_{it} = \begin{cases} 1 \; if \; 6 \le tenure < 7 - subset \; (1) \\ 0 \; if \; 5 \le tenure < 6 \\ \\ 1 \; if \; 17 \le tenure < 18 - subset \; (2) \\ 0 \; if \; 18 \le tenure < 19 \end{cases}
$$

Similarly, treatment for the second request is defined as follows:

$$
Treatment_{it} = \begin{cases} 1 \; if \; 6 \le tenure < 7 - subset \; (3) \\ 0 \; if \; 5 \le tenure < 6 \\ \\ 1 \; if \; 9 \le tenure < 10 - subset \; (4) \\ 0 \; if \; 8 \le tenure < 9 \end{cases}
$$

Parameters β_4 and β_5 are the treatment effect estimates. They measure the effects of changes in UI eligibility criteria introduced by PM665 and Law 13.134, respectively. Since the two reforms eliminated eligibility for workers with tenure of more than six months but less than 18 months, negative values of β_4 and β_5 imply that UI benefits lead to higher unemployment when workers

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[18] This strategy is similar to that employed by Carvalho, Corbi, and Narita (2018) and Van Doornik et al. (2018), but our data allow us to consider treatment separately for the first and second requests.
[19] Please note that eligibility criteria are based on UI legislation. A person who works at least 15 days in January (counts as one month), then works in the four subsequent months and at least 15 days in June accumulates six months toward UI eligibility. The data used in this paper and described in the next section provide a means to better account for these criteria than data used in previous studies.

are eligible for UI benefits and vice versa.[20] This specification is calculated separately for workers making their first or second UI requests because the eligibility criteria differ according to the number of requests under the PM 665, Law 13.134, and the previous rules.

Identification for difference-in-difference estimation requires both exogenous treatment indicators and treatment and control groups have parallel trends before the unexpected program change. Figure 1 shows that monthly dismissal rates for treatment and control groups in data subset (1) for the first request have parallel patterns before changes in UI eligibility rules, but with treatment group members more likely to be dismissed. Importantly, the monthly differences in dismissal probabilities between control and treatment groups are smaller after changes in eligibility rules, particularly after the permanent changes made by Law 13.134.

Figure 1 Dismissal Probabilities for Short-tenure Workers with No Prior UI, Subset 1 (see Table 4)
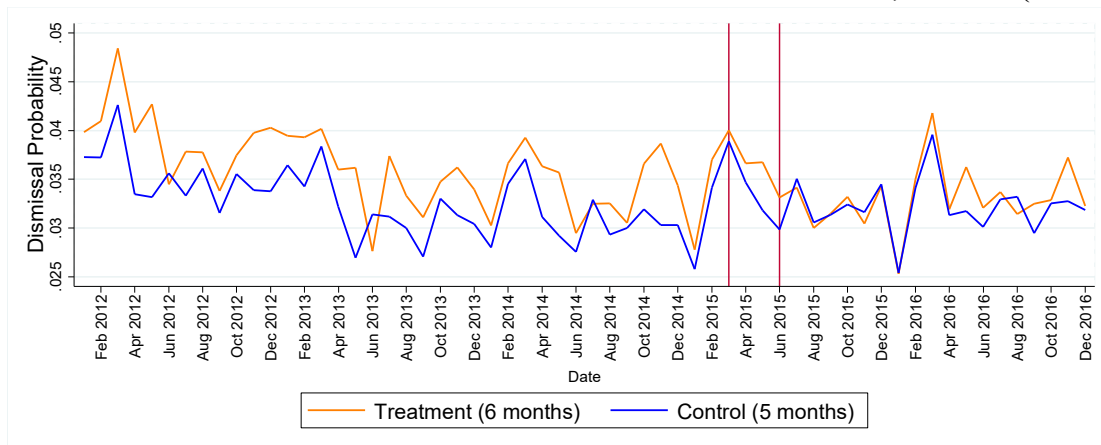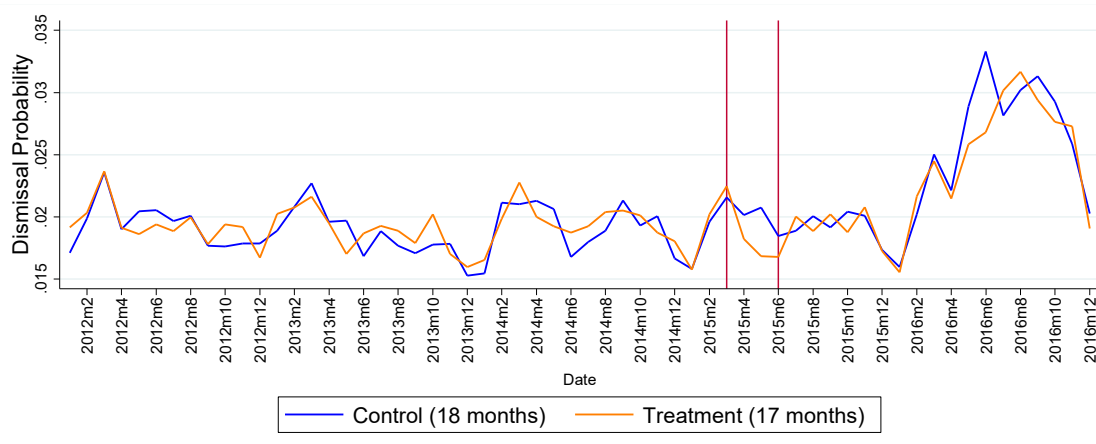

Figure 2 Dismissal Probabilities for Long-tenure Workers with No Prior UI, Subset 2 (see Table 4)

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[20] The reforms eliminated eligibility for workers with more than six months but less than 18 months tenure, but our estimates only use data around the six-month discontinuity under the assumption that workers do not control their durations with the objective of qualifying for UI.

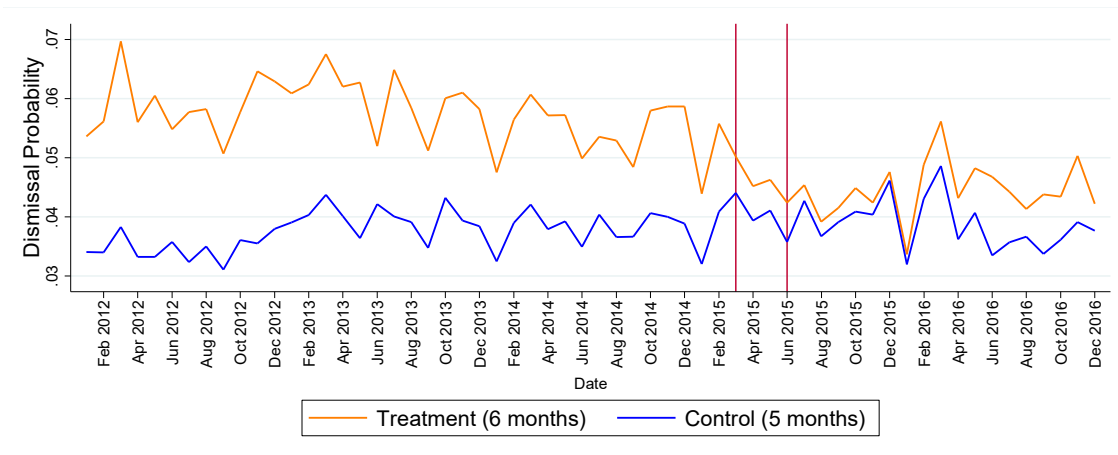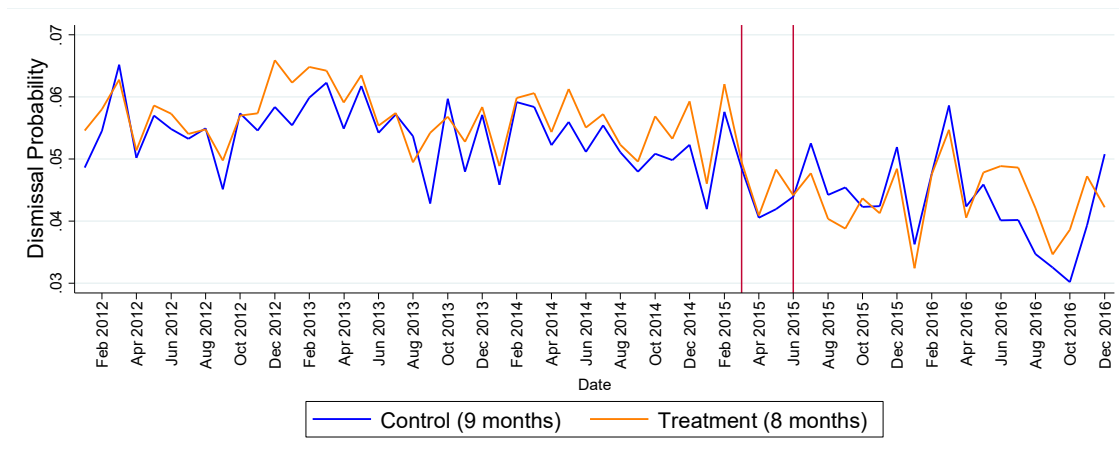**Figure 3 Dismissal Probabilities for Short-tenure Workers with One Prior UI Spell, Subset 3 (see Table 4)**

Figure 4 Dismissal Probabilities for Long-tenure Workers with One Prior UI Spell, Subset 4 (see Table 4)

Figures 2–4 show the monthly dismissal rates for the treatment and control groups in the other three data subsets. Monthly layoff rates for treatment and control groups with a longer tenure but without a prior spell of UI benefit receipt are illustrated Figure 2. This graph shows very similar pre-trends in both levels and changes in rates, with the biggest differences observed after PM 665 went into effect after February 2015.

Figure 3 shows parallel pre-trends for the short-tenure data subset with one prior spell of UI receipt, but the layoff rates were higher in every month for the treatment group. The difference in layoff rates shrinks considerably after the PM 665 decree became effective in March 2015 and is even smaller after Law 13.134 went into effect after June 2015. For the long-tenure data subset with one prior UI receipt spell (Fig. 4), the layoff rates were similar in levels and changes in all

months before March 2015, with the treatment group being slightly higher than the control group through much of the period. Parallel changes in the monthly layoff rates for the treatment and control groups continue after PM 665, but the layoff rates for the treatment group are somewhat lower after Law 13.134. Results from the estimation of difference-in-difference models controlling for individual, industrial, and seasonal characteristics will more precisely illuminate the differences.

RESULTS

Table 5 presents estimates for the impacts of PM 665 and Law 13.134 on layoff probabilities among workers with zero or one prior UI spell. For reference to prior evaluations of the 2015 Brazilian UI eligibility changes, the top row of Table 5 presents estimates using data without any restriction on the number of prior UI spells. Our estimate suggests that the UI eligibility restrictions introduced by PM 665 decrease the probability of layoff for short-tenure workers who would have been UI eligible but no longer had eligibility by 0.35 pp (percentage points). This is much smaller than the estimates of 0.69 pp by Carvalho, Corbi, and Narita (2018) and 0.53 pp by Van Doornik et al. (2018).

For workers in subset 1 (short-term tenure and without a prior UI request), the eligibility restriction introduced by PM 665 is estimated to decrease the probability of layoff by 0.18 pp for workers who were eligible and became ineligible. These results based on proper data subset definitions, suggest that earlier studies were overestimating the decrease in dismissal probability due to the PM 665 by a factor of three for workers without a prior UI request. The relative decrease in layoff probability is larger after approval of Law 13.134, with an estimated reduction in probability of layoff of 0.41 pp as compared to the period before March 2015. This decrease is smaller than the 0.77 pp decrease estimated by Carvalho, Corbi, and Narita (2018).

Data subset 2 includes long-tenure workers without a prior UI spell. Treatment and control groups were eligible before PM 665, and the treatment group becomes ineligible after PM 665 but regains eligibility with Law 13.134. As expected, the UI eligibility restriction introduced by PM 665 relatively decreases by 0.23 pp the probability of layoff for workers who were eligible and became ineligible. Interestingly, the coefficient for Law 13.134 is not significant. This result is expected because both the control and treatment groups were eligible before February 2015 and

after Law 13.134 was enacted. These results confirm the visual suggestion from Figure 2 that shows dismissal rates for the treated group fall below those of the control group in the months after the introduction of MP665 and then return to the same level as the control group after the approval of Law 13.134. Carvalho, Corbi, and Narita (2018) also find a discontinuity around the 18th month, but they report different estimates. Their results overestimate the decrease in dismissal probability due to the introduction of the PM 665, and contrary to our results, suggest an impact of Law 13.134 on the probability of dismissal.

Table 5   Effects of UI Eligibility Change on Layoffs

Data (treatment, control): Request	PM665 effect	Law 13.134 effect	Observations
Data subsets (6, 5): All requests	-0.00352**	-0.00556***	58,149,132
	(-0.00161)	(-0.000715)	
Data subset 1 (6, 5): First request	-0.00179*	-0.00411***	29,797,067
	(-0.000943)	(-0.00107)	
Data subset 2 (17, 18): First request	-0.00228 ***	-0.000777	17,743,021
	(-0.000556)	(-0.000656)	
Data subset 3 (6, 5): Second request	-0.00895***	-0.0105***	10,478,613
	(-0.00212)	(-0.00119)	
Data subset 4 (8, 9): Second request	-0.00398***	-0.00909 ***	8,502,679
	(-0.00126)	(-0.00135)	

NOTE: Standard errors are in parentheses and are clustered by the state in which the job is located because the residual is likely to be correlated within state labor markets; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The treatment and control values are tenures in months as described in Table 4.

For short-tenure workers with exactly one prior UI claim (data subset 3), we estimate that PM 665 decreased the probability of layoff by 0.89 pp for workers who were eligible and became ineligible for UI. The estimated effect of Law 13.134 is slightly stronger (1.1 pp). This result suggests that the overall estimates provided by Carvalho, Corbi, and Narita (2018) and Van Doornik et al. (2018) were probably influenced by workers with multiple previous UI claims.

Data subset 4 includes workers with exactly one prior UI claim and tenure of 8 months (treatment) and 9 months (control). Treatment and control groups were both UI eligible before PM 665, both groups become ineligible after PM 665, and the treatment group regains eligibility after the approval of Law 13.134. As expected, the UI eligibility restriction introduced by PM 665 reduces the layoff probability 0.40 pp and Law 13.134 decreases the layoff probability by 0.91 pp for workers who were eligible and became ineligible.

Compared to previous studies, we estimate smaller effects of the UI eligibility changes on employer layoffs from formal sector jobs. We believe that our results are different from earlier studies because of our ability to clearly identify workers having had zero or one prior UI request, and thereby defining treatment and control groups closer to the threshold of the new UI eligibility criteria.[21] The next step is to use UI administrative data to consider whether employer layoff behavior is influenced by collusion between employers and employees to benefit from the UI system.

Tests for Collusion

Even though UI benefits in Brazil are financed from general revenues of the federal government, employers still have an incentive to collude with workers to extract wage subsidies from the system.[22] The availability of UI benefits could help ease workers into furlough so as to conserve on the payroll budget during slack demand while still maintaining employer–employee contacts. To test for the possibility of collusion in layoffs between employers and workers in their first or second UI request, we estimate the probability of recall to the same employer on a subset of workers who went back to work in the formal sector within ten months after finishing UI benefit receipt. That is, in the data subset of all workers who return to work within ten months after layoff, what proportion is recalled by the same firm soon after entitlement to UI benefits ends? We use a specification similar to the full interaction difference-in-difference model used for estimating treatment effects. The distinction is that we estimate the model on a subset of workers that returned to the formal labor market. This means that the dependent variable is a dummy that takes the value of one if the worker is rehired by the same firm between four and 10 months after being laid off and zero otherwise.[23]

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[21] When laid off workers are eligible for UI, data are based on the job-layoff date (for unjustified dismissals). We also performed the same analysis using data for workers with justified dismissals, in which case the workers are not eligible for UI. These placebo regressions show no effect of changes in legislation on layoff probabilities. Results are available upon request.

[22] In the U.S. context where employer UI taxes are experience rated, Feldstein (1976) asserted that imperfect experience rating allowed employers to capture wage subsidies. Topel (1984) provided empirical evidence that showed states with wider experience rating offered fewer opportunities for wage subsidies. In Brazil, where UI benefits are publicly financed, opportunities for wage subsidies from UI are large.

[23] This interval between four and 10 months was used to compare our results with those provided by Van Doornik et al. (2018). Alternative results that use a variation of the dependent variable where a dummy variable that takes the value of one if worker *i* is reemployed by the same firm in 2015 provide similar results and are available upon request.

Column 1 in Table 6 presents impact estimates for the change in eligibility introduced by PM 655, the second column provides estimates of impacts from Law 13.134, and the last column shows the data subset sizes of reemployed UI beneficiaries used for estimation. For short-tenure workers (data subset 1) who were just barely eligible for UI before the reforms, our estimates suggest that the probability of being rehired by the same employer is about 1.3 pp lower after PM 665.[24] The magnitude of the recall effect is not significantly different after the approval of Law 13.134, with the probability of being rehired by the same employer about 1.8 pp lower. Our results therefore provide some evidence of employer–worker collusion in strategic layoffs among workers with minimal employer tenure. However, among workers with longer job tenure (data subset 2), there is no evidence of collusion in layoffs before the first UI request (Table 2).

Table 6 Effects of UI Eligibility Change on Return to Prior Employer within 10 Months

Data (treatment, control): Request	PM665 effect	Law 13.134 effect	Observations
Data subset 1 (6, 5): First request	-0.0130***	-0.0182***	600,950
	(-0.00378)	(-0.00385)	
Data subset 2 (17, 18): First request	0.00304	0.00696	209,756
	(-0.0049)	(-0.00511)	
Data subset 3 (6, 5): Second request	-0.0167**	-0.00959	330,430
	(-0.00791)	(-0.00619)	
Data subset 4 (8, 9): Second request	0.0125*	-0.000587	290,690
	(-0.00732)	(-0.0074)	

NOTE: Standard errors in parentheses and clustered by states; *** $p<0.01$, ** $p<0.05$, * $p<0.1$. The treatment and control values are tenures in months as described in Table 4.

For short-tenure workers making their second request (data subset 3), there is evidence of employer collusion under PM 655, but the Law 13.134 had no effect on employer recalls, indicating that looser UI eligibility restrictions imposed by the new law (compared to PM 665) might not be enough to change collusion behavior.

There is no evidence of employer–worker collusion among moderate-tenure workers in their second UI request (data subset 4), suggesting that the decrease in the probability of unjustified dismissal might not be associated with the direct collusion channel between workers and firms.[25] This suggests that changes in legislation might affect collusion more when workers have a shorter

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[24] Estimations considering workers reemployed by the same firm four to 10 months after being laid off as in Van Doornik et al. (2018) show that the probability of being rehired by the same employer is about 0.9 pp lower after PM 665 for workers in the treatment group. This is half of the effect estimated by Van Doornik et al. (2018), indicating that they overestimate the collusion effect.

[25] Surprisingly, estimates suggest a temporary increase in the degree of collusion after PM 665 even though no effect was expected because treatment and control groups both lost eligibility after PM 665 was put in place.

job tenure and when the eligibility criteria is stricter. Nevertheless, the estimate of the effect of Law 13.134 reported in Table 6 is not significant, suggesting that the decrease in the probability of job layoffs might not be associated with the direct collusion channel between workers and firms.

CONCLUSION

Using UI program administrative data from Brazil, this paper exploits exogenous program changes introduced by a presidential decree and legislation in 2015 to evaluate the heterogeneous impacts of changes in UI eligibility criteria on layoffs. In contrast to previous studies, we use UI program administrative data to more precisely measure how workers are affected by changes in eligibility rules. Importantly, the availability of UI program administrative data allows us to evaluate impacts on layoffs according to the number of prior UI benefit requests. This is important since eligibility rules under PM 665 and Law 13.134 changed in this regard. These data allow us to properly establish treatment and control groups for a quasi-experimental evaluation.

We were able to confirm results from previous research that increasing restrictions in UI eligibility criteria in Brazil during 2015 reduced layoff probabilities. However, our results suggest that previous studies overestimated the reductions in dismissal probabilities by a factor of three, and we conclude this overestimation is due to the inability of previous studies to precisely measure the number of prior UI requests. This paper provides the first estimates of heterogeneous impacts on workers that are distinguished by the ordinal number of the benefit request. We show that changes in UI eligibility rules were more effective in reducing dismissal of workers before their second benefit request. Our results provide some evidence that restrictions on UI eligibility reduced collusion between workers and employers seeking subsidies from the UI system.

Therefore, we suggest that studies aiming to provide evidence on the dynamics of changes in UI program parameters should include the use of program administrative data to produce better and more precise estimates of impacts from program changes. In the current context, using data that obscure the ability to assess the UI request history of workers can lead to incorrect or imprecise evidence for making sound public policy.

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